

#### REMARKS

Reconsideration is respectfully requested of the rejection of amendments claims 1-5, 11, 12, 17-36, 40, 42, 43, 48-49 and 94-96. It is respectfully submitted that each of these claims is enabled by the specification of the instant application under 35 U.S.C. §112, first paragraph, and that each of these defines patentably over the prior art, including Seitz et al. US 5,925,595 and Becher et al. US 4,563,212 under 35 U.S.C. §103(a).

Applicants respectfully submit that the issues can be clarified by telephone interview for purposes of any further prosecution or appeal that may remain necessary after consideration of the instant response. Thus, the scheduling of such interview is respectfully requested prior to the current date for appeal.

#### I. Status of Claims

Claims 1, 24, 25, 32, 55, and 56 are amended to expressly require that the "auxiliary amine" is different from the "principal amine." Support for this amendment is readily found, *inter alia*, in the disclosure that the isocyanate is reacted with "other monomers [plural]" that comprise a principal amine and an auxiliary amine (many locations including p. 5, lines 3-6), that "the polyurea polymer is the reaction product of reactants [plural] comprising a principal amine and an auxiliary amine" (p. 10, lines 11-14), that the auxiliary amine affects the permeability of the shell (p. 5, lines 15-17, and p. 9, lines 5-9), that the permeability is varied by varying the ratio of the amines (e.g., p. 11, line 28 to p. 12, line 2), and that "[f]or purposes of differentiating the two amines, one amine is designated the principal amine and the

other amine is designated the auxiliary amine" (p. 8, lines 32-34). Further support for the amendments is provided by the working examples and drawings which describe the use of two different amines.

Claims 1, 24 and 25 are also amended to provide an antecedent for "microcapsule," and claim 56 has been amended to substitute "herbicide" for "pesticide" on line 4 and thereby provide an antecedent for "herbicide" on line 5.

Claim 11 is amended to depend from claim 1 rather than from claim 10 and claim 42 is amended to depend from claim 32 rather than from claim 41. This amendment obviates the objection to claims 11 and 42 as stated at p. 23 of the Office action.

Applicants respectfully acknowledge the election of species wherein A) the polyisocyanate is the biuret-containing adduct of hexamethylene-1,6-diisocyanate, B) the principal amine is triethylenetriamine, C) the auxiliary amine is polyoxypropylenetriamine, and D) the pesticide is alachlor.

Applicants further acknowledge that claim 6-8, 10, 13-16, 37-39, 41, 44-47, and 97-99 are withdrawn from consideration as not reading on elected species.

#### **I. Withdrawal of Written Description Rejection**

Withdrawal of the §112, first paragraph, written description rejection is respectfully acknowledged.

#### **II. Claim Rejections Under 35 U.S.C. §112**

Reconsideration is respectfully requested of the rejection of claims 1-5, 9, 11, 12, 17-36, 40, 423, 43 and 48-69 under 35 U.S.C. §112 for lack of enablement.

Although prior to Applicants' invention the half lives of microcapsules comprising a core material derived from a combination of a polyisocyanate and plural amines was indeed unpredictable, it is respectfully submitted that the combination of the description provided in the instant specification and the experimental results reported therein fully enables one skilled in the art to practice the invention as claimed. More particularly, it is submitted that the guidance provided by Applicants enables one skilled in the art to produce microcapsules from the combinations encompassed by claim 1 wherein the auxiliary amine selected from the group consisting of an epoxy-amine adduct, a polyetheramine, or an amine comprising a moiety selected from the group consisting of an aryl moiety and a cycloalkyl moiety; and the principal amine comprises a linear polyalkylamine or an epoxy-amine adduct.

The specification explains that the function of the auxiliary amine is to affect the permeability of the shell wall (p. 5, ll. 15-17, ¶[0013] of US 2004/0137031), the permeability is governed by the auxiliary to principal amine ratio (p. 8, ll. 8-19; ¶[0026] of US 2004/0137031), and that a particular auxiliary amine in combination with a given pesticide will have either an increasing or decreasing effect on permeability (p. 8, l. 34 to p. 9, l. 8; ¶[0029] of US 2004/0137031), a trend that can be established with a minimum of threshold experimentation. The effect of amine ratio for particular auxiliary principal amine combinations is described in the working examples and displayed in Figs. 1B and 2. Specific teachings on the effect of particular auxiliary amines that increase permeability are provided at p. 15, l. 19 to p.

17, l. 23 (§§[0050] to [0063] of US 2004/0137031), while specific teachings on the effect of particular amines which decrease permeability are found at p. 17, l. 24 to p. 18, l. 7 (§§[0064] to [0065] of US 2004/0137031).

Moreover, a relative measure of crystallinity is given in Table 4 of Example 5, and the specification teaches that the permeability of a microcapsule is generally expected to decrease as an amine with a higher degree of crystallinity is substituted for an amine with a lower degree of crystallinity in a polyurea system based on a fixed polyisocyanate composition; and that the reverse of this substitution is also generally true (col. 23, ll. 20-26; §[0083] of US 2004/0137031).

As illustrated in the plot of data presented in paragraph (4) and plotted in paragraph (5) of the Becher declaration of October 4, 2010, the half lives of microcapsules prepared according to the invention, and more particularly according to the combination of triethylene tetraamine and m-xylene, strongly correlate with the ratio of m-xylene to triethylene tetraamine. The instant Office action offers no evidence or reasoning as to why other combinations of principal and auxiliary amines, including those where both the principal and the auxiliary amine are within the scope of pending claim 1, would not show a pattern comparable in principle to that demonstrated for triethylene tetraamine and m-xylene.

On the contrary, the evidence of record indicates that the half lives exhibited by combinations of principal and auxiliary amines follow an essentially continuous typically mono-modal curve that allows one skilled in the art to readily adjust the principal:auxiliary ratio to values that

yield a half life in the 5 to 100 day range with a minimal number of experiments. Enablement does not require that the range of ratios that yield a half life in the claimed range be the same for every combination of amines. But starting, e.g., with a 50/50 ratio, or another ratio informed by results with similar combinations of amines, one skilled in the art can easily determine which direction to move with a minimal number of experiments. And experience with a few rationally selected pairs of amines can rapidly minimize any uncertainty as to where to start and which way to move in ratios of other amines.

Thus, while the nature of the invention made half life unpredictable in the prior art, Applicants have provided critical disclosure which diminishes the unpredictability and provides those skilled in the art with a reasonable and rational basis for routinely identifying combinations of amines that yield half lives in the 5 to 100 day range vs. those that do not. Moreover, the amendment submitted in response to the prior Office action significantly diminished the breadth of the claims. Of course, in the absence of context, the matter of breadth is a relative concept, but the general and specific disclosure in the instant specification provides the tools by which the breadth can be reasonably and routinely scanned.

Although both the instant Office action and Applicants' prior response to the previous action deal with the issue of "inoperative embodiments," the instant claims are self-limited to formulations that exhibit the claimed 5 to 100 day half life, and thus do not in fact read on anything inoperative. The question is whether the specification enables practice of the invention as claimed.

As recognized in *In re Vaeck*, 947 F.2d 488, 496 (Fed.Cir. 1991), it is well settled that patent applicants are not required to disclose every species encompassed by their claims, but instead provide sufficient disclosure, either through illustrative examples or terminology, to teach those of ordinary skill how to make and use the claimed invention.

It is undisputed that Applicant has disclosed examples which do meet the claims, and has provide a test protocol to determine whether any other candidate formulation also does. With the guidance of the working examples, and the specific disclosure that particular amines either increase or decrease permeability, and that this is related to crystallinity (see p. 23, lines 20-26), those skilled in the art are provided with the tools to rationally and expeditiously explore the contours of the line of demarcation between combinations of amines which meet the claims and those which do not.

It is respectfully submitted that enablement does not require that the claims spell out the multi-dimensional compositional interface between formulations that meet the claims and those which do not. The line of demarcation is provided by a hard functional criterion which is easy to measure. Further guidance is provided for readily identifying the amine ratio at which that line is crossed for any particular combination. It is Applicants obligation to teach those skilled in the art how to meet the claim, not how to avoid it. That all the combinations of amines be tested by Applicants to lay out a multi-dimensional compositional surface of mathematical

demarcation between formulations that meet the claim and those that do not is well beyond the requirements of §112.

It is respectfully submitted that Applicants are entitled to scope of protection commensurate with their contribution to the art. Competitors having the benefit of Applicants disclosure, including the smooth pattern of half life vs. amine ratio within the claimed range, as reflected in the working examples, will readily identify other combinations of different amines which provide similar advantageous means for control of half life. Thus, if Applicants were relegated to the minimal scope of coverage afforded by specific examples, competitors could appropriate Applicants contribution with impunity. While the Office action emphasizes the burden of routine testing that a hypothetically hapless competitor might be required to make, a real world competitor will embrace such routine testing with enthusiasm given the opportunity to design around claims narrowly confined to the species particularly tested in the examples.

The merit of Applicants position has been acknowledged in the case authorities. For example, in *United States v. Teletronics*, 857 F.2d 778 (Fed. Cir. 1988), the court upheld a claim directed to healing bone fracture by providing a current flow into the fracture via a "means for connecting" the current into the fracture site. The only disclosed embodiment used a stainless steel electrode and the defendant used titanium. The defendant argued that the current range would vary with the composition of the electrode and that the invention was enabled only for stainless steel. Thus, it was undisputed that a dose/response curve would need to be obtained for any other

electrode material which one skilled in the art wished to employ; and the district court thought that the time and expense indicated that undue experimentation would be required. But the Federal Circuit reversed, noting that:

"[i]t is undisputed that the patent disclosures are enabling with respect to stainless steel electrodes, with the range of current for such electrode set out in the specification. The specification shows this range of current was obtained by a dose response test. Next, according to the district court "those who were expert in the field and actually working with bone, doing electrical stimulation experiments ... would know how to conduct a dose response study to determine the appropriate current to be used with other materials as electrodes." *Id.* The appropriate levels of current for other electrodes to promote bone growth and avoid fibrous tissue could, therefore, be determined. Finally, the emphasis by the district court on the time and cost of such studies is misplaced. While these factors may be taken into account, in the circumstances of this case we are unpersuaded that standing alone they show the experimentation to be excessive. The test of enablement is whether one reasonably skilled in the art could make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation." 857 F.2d at p. 785

Although the defendant in *Telectronics* faced a clear and convincing evidence standard, the claim there at issue had been allowed by the PTO and the reasoning of the case is clearly applicable here.

Moreover, no clear and convincing evidence standard aided the applicant in *in re Bowen*, 492 F.2d 859 (CCPA 1974) where the claim was directed to a polymerization process which comprised filtering a polymerizable material having a viscosity less than 400 poises to remove finely divided pigment that tended to form agglomerates under polymerizing conditions. The PTO had rejected the claim as



not enabled because the only polymer exemplified in the disclosure was nylon. The PTO reasoned that nylon was not representative of "all polymerizable materials," and noted that the claim read on filtering inorganic as well as organic polymers under polymerizing conditions. But the court held that the claims met the enablement standard because no persuasive reason was given by the Patent Office why the specification does not realistically enable one skilled in the art to practice the invention as claimed., 492 F.2d at p. 863.

In the instant application, the reality is that a competitor skilled in the art will readily apply the specific examples and principles of permeability and crystallinity described by Applicants and readily identify a raft of combinations of amines other than those specifically disclosed by Applicants, and with modest to minimal experimentation find combinations that possess the requisite 5 to 100 day half life but readily evade claims that are limited to the specific combinations of amines for which the half lives are exemplified in Applicants' working examples. In enacting §112, the intent of Congress is to require that the invention be placed in the possession of those skilled in the art, but not to impose arbitrary limitations of scope which allow the invention to be readily appropriated with impunity by the patentee's competitors. Such narrow constriction can only serve to discourage disclosure and retard progress in the art.

Accordingly, it is respectfully requested that the rejection of claims 1-5, 11, 12, 17-36, 40, 42, 43, 48-49 and 94-96 under §112, first paragraph, be withdrawn.

### **III. Claim Rejections under 35 U.S.C. §103(a)**

Reconsideration is respectfully requested of the rejection of claims 1-5, 11, 12, 17-36, 40, 42, 43, 48-49 and 94-96 under §103(a) as obvious from Seitz US 5,925,595 in view of Becher US 4,563,212.

As has been discussed in detail in the course of prosecution, Seitz et al. discloses microencapsulated compositions which are the product of reaction of a triisocyanate, an aliphatic isocyanate and a polyamine. Seitz lists a variety of different amines that can be combined with the plural isocyanates, but there is no teaching or suggestion in Seitz of using a combination of amines.

#### A. Claim Amendments

In part, at least, the rejection is predicated on the Examiner's concern that the claims as previously pending do not unequivocally specify that the auxiliary amine be different from the principal amine. On this basis, the Office action reads the claim directly on formulations of Seitz or Becher which contain only a single amine for reaction with an isocyanate (Becher) or plural isocyanates (Seitz).

In response to this ground of rejection, Applicants have amended the claims to expressly require that the auxiliary amine differ from the principal amine. This is not a narrowing amendment because Applicant submits that it was unambiguously clear that the claims have always required an auxiliary amine that differs from the principal amine. In discussion of the Status of the Claims hereinabove, Applicants have cited the passages that make this difference clear and unequivocal. However, to advance

the prosecution, Applicants have made explicit what was unambiguously implicit, which should obviate any rejection over the art grounded on a construction by the Examiner that the claims could be read on a formulation comprising a single amine component.

Since many of the grounds for rejection under §103 lean heavily on a construction of the claim that requires only a single amine, it is believed that the instant clarifying amendment should substantially advance the cause for allowance.

B. Non-Obviousness of the Subject Matter Claimed

Seitz teaches that permeability of the shell wall can be controlled by using a combination of isocyanates, which are components of a polyurea shell that are contained in the oil phase and react at the interface with an amine dissolved in the aqueous phase. It is respectfully submitted that one skilled in the art would not have found Seitz's disclosure to provide a basis for controlling permeability by using a combination of amines that are contained in the aqueous phase.

As the Examiner has emphasized, the art is unpredictable. Prior to the present invention, there was no basis for one skilled in the art to have extrapolated from Seitz's teaching of a plurality of isocyanates to a conclusion that any useful effect might be achieved from a combination of different amines. The unpredictability would have been compounded by the known fact that the isocyanate is sourced in the organic phase whereas the amine is sourced in the aqueous phase. Nowhere does Seitz discuss factors such as the microstructure of the interface, phase equilibria, kinetic effects, or mass

transfer effects, or how these might relate to control of shell wall properties by use of two different isocyanates. Much less does he provide any teaching on these parameters that would lead one skilled in the art to select a combination of different amines rather than a combination of different isocyanates with an expectation of controlling properties of the shell wall. There is nothing in Seitz to help one skilled in the art understand whether effects of mass transfer, kinetics or phase equilibria might differ materially with respect to a reactant transferring from the aqueous phase vs. a reactant diffusing through the organic phase, nor any basis for predicting whether a combination of different aqueous phase amines would provide any useful effect at all, much less a basis for expectation of successfully controlling permeability to maintain half life in the range of 5 to 100 days.

Moreover, even if one skilled in the art were satisfied that mass transfer, kinetics, phase relationships, or differences between amine and diisocyanate with respect to these parameters would have no material effect, there was still no basis in Seitz to anticipate that any combination of different amines would be a reasonable candidate for control of half life within the 5 to 100 day range called for in the instant claims.

As demonstrated by the data reported in the Becher declaration of October 4, 2010, paragraphs (10) to (13), the data reported by Seitz demonstrate that the relationship between half life and the ratio of two different isocyanate monomers is erratic, volatile, and unreliable. The Seitz data would particularly discourage one skilled in the art from using any combination of

reactants as a means to control half life within the 5 to 100 day range called for by the instant claims. As illustrated in the plot of Seitz data presented in paragraph (11) of the Becher declaration, the half life as a function of the ratio of different isocyanates (N3200 and TMXDI) when reacted with triethylene tetraamine escalates rapidly from essentially zero to nearly two years over a narrow range of composition, and declines from a such peak in a manner that is erratic, unpredictable, and for the most part remains at levels well in excess of 100 days. The data for the same combination of isocyanates and diethylene triamine is even more volatile, falling rapidly though inconsistently from the neighborhood of 6 years to near zero. See Becher paragraph (12).

Thus, even if it were assumed *arguendo*, that it were *prima facie* obvious to combine two different amines to have some effect on release rate, there is no reason or motivation in Seitz to make such combination for purposes of controlling the half life in the range of 5 to 100 days as required by the instant claims. It is respectfully submitted that Becher does not make up for the deficiencies of Seitz. Becher describes only formulations that contain a single amine. Becher's only mention of using a mixture of amines is for purposes of scope, in claim 13, to make certain that infringement of that claim is not avoided by use of more than one amine. But there is no affirmative teaching in Becher of any combination of different amines, and certainly no enabling disclosure of such combination. Becher's care in extending the scope of his patent coverage does not translate into any teaching that a combination of amines would be effective for controlling the half life in

the 5 to 100 day window; and certainly Becher offers nothing to neutralize the Seitz data in effectively discouraging the attempt.

Thus, it is respectfully submitted that there is no *prima facie* basis for obviousness in the combination of Seitz and Becher. The favorable results actually obtained by Applicants, as further illustrated in the plot presented in the Becher October 2010 declaration, establishes that the instant specification is enabling and further support non-obviousness of the claims. And the unfavorable data of Seitz alone is sufficient to show that using a combination of amines to control the half life in the claimed 5 to 100 day range is *prima facie* non-obvious.

#### C. Specific Arguments Articulated in the Office Action

In the Office action, the Examiner offers several particular arguments in support of the §103(a) rejection and in counterpoint to the positions stated by Applicants in the previous response. It is respectfully submitted that none of these arguments should be found to establish a basis for obviousness of the claims currently pending.

##### 1. Claim Construction; Single vs. Plural Amines

Much of the analysis supporting a finding of obvious begins with a construction of the claims as not requiring more than a single amine. With the instant amendment, such ground of rejection is obviated. With this premise removed, it is respectfully submitted that the basis for obviousness substantially dissipates.

##### 2. Obvious to Try

It is well established that obvious to try does not establish obviousness unless there is a reasonable basis for expectation of success in controlling half life in the

5 to 100 day range. Given the volatile and erratic data of Seitz, the basis for expectation of success is respectfully submitted to be non-existent. Again, assuming *arguendo* that one skilled in the art might have expected the use of an auxiliary amine to have some effect on release rates, there is absolutely no basis in the references or otherwise in the art for an expectation that varying an auxiliary to principal amine ratio could provide the means for controlling the half life within the range of 5 to 100 days.

3. The Effect of "Other Components" on Half Life

At p. 20 of the action, the Examiner asserts that "the art would find it obvious to use more than one amine, since Seitz et al teach that other components may be varied to improve the permeability of the shell wall."

Applicants have been unable to identify any teaching in Seitz that other components of the shell wall may be varied to improve the permeability. On the contrary, the only teaching of parameters other than the selection of isocyanates which Applicants can identify is found at col. 20, ll. 35-37 wherein Seitz says that:

"In addition to the favorable temperature dependence, the release rate is also dependent on the chemical nature of the permeant."

Cf. col. 4. 1. 64 to col. 5, 1. 3 wherein Seitz teaches that:

"In general, a simple method has been found to produce a polyurea shell wall whose permeability can be readily adjusted to control release. The degree of permeability is regulated by a simple compositional change in the wall's precursors that modifies the segmental mobility of polymeric wall. This is accomplished by using a blend of two aliphatic isocyanates."

Such disclosure manifestly fails to lead one skilled in the art to the instantly claimed invention.

#### 4. Conflict Between §112 and §103(a) Rejections

As discussed above, it is respectfully submitted that there is no basis in Seitz for an expectation that selection of more than one of the eight amines taught by Seitz for reaction with a mixture of isocyanates would yield a product having a half life between 5 and 100 days. However, if were assumed that an expectation of success were obvious from such combination, it would directly conflict with the premises on which the enablement rejection is grounded. There is no rationale ground on which the putative predictability from Seitz is exclusive of predictability from Applicants' disclosure of the use of combinations of amines. Thus, the §103(a) rejection definitively undercuts the §112 rejection.

But the reality is that it was not predictable from Seitz that the claimed formulation could be successfully produced, and therefore, there is no basis for the §103(a) rejection. While the latter conclusion may theoretically revivify the enablement issue, it is respectfully submitted that enablement is fully established on the grounds discussed above. There was no predictability in the art prior to Applicants' invention. On that, Applicants and the PTO are agreed, which effectively destroys the basis for rejection under §103(a). But enablement of the invention as claimed is provided by Applicants' novel disclosure, thereby obviating issues of enablement under §112.

#### 5. Basis for Comparison

As carefully explained in the Becher declaration, the comparison which the declaration provides is entirely



valid. It is respectfully submitted that the "thickener" issue is a red herring.

As explained in the January 2010 declaration of David Becher, the thickener is a water soluble gum which Seitz adds only after the microcapsules are prepared. See paragraph (7). Thus, it cannot have affected the properties of the shell wall. Moreover, as Setiz himself explains, the half life is determined only after the aqueous formulation is diluted to the point that the aqueous phase is a perfect sink, and even before dilution the gum is added as a small fraction relative to the proportions of amine, isocyanate and water. Thus, there is no basis on which the thickener could have had any effect on the release rates reported by Seitz.

Accordingly, the comparison of the half lives reported by Seitz with those exemplified in the instant specification are entirely valid and demonstrative of the unobviousness of using a combination different amines in accordance with the claimed invention. See Becher, January 2010, paragraphs (7) to (11).

#### D. Dependent Claims

Each of dependent claims 2-5, 11, 12, 17-23, 26-31, 33-37, 48-69 and 94-96 is respectfully submitted to be patentable based on the patentability of the independent claim from which it depends, and further on the feature which it adds.

Applicants more particularly submit that there is nothing in Seitz which remotely suggests the difference in Hildebrand solubility that is called for in claims 9 and 22, 40 or 59. Neither Seitz nor Becher so much as mention Hildebrand solubility parameters. There is utterly no

basis in either reference that would lead one skilled in the art to select a combination of amines as called for in claim 9 and 40, which produce a microcapsule wherein the absolute value of the arithmetic difference between the respective Hildebrand solubility parameters of the core material and shell is less than would be obtained by reaction of the polyisocyanate in the absence of the auxiliary amine in a reference polymerization system of composition otherwise identical to that of said shell-forming polymerization system.

Nor is there anything in either Seitz or Becher which could begin to lead one skilled in the art to a combination of amines that imparts shell wall properties of claim 22 or 53, i.e., wherein the shell and the core material each has a Hildebrand solubility parameter, and the absolute value of the arithmetic difference between the respective Hildebrand solubility parameters of the core material and shell is greater than  $0.5 \text{ Joule}^{1/2}/\text{cm}^{3/2}$  and less than about  $5 \text{ Joule}^{1/2}/\text{cm}^{3/2}$ .

Neither Seitz nor Becher so much as mentions Hildebrand solubility, or its effect on controlled release of pesticide.

The Office action attempts to dismiss claims 9, 22, 40 and 59 by simply insisting that "the properties relating to solubility would be present in the microcapsule and formulations of Seitz et al, given the fact that the microcapsules of Seitz et al. can be formed from the same components as those taught in the claimed invention." But this is a manifest *non sequitur*. The formulations disclosed and claimed in the instant application comprise both a principal amine and an auxiliary amine. The

formulations of Seitz do not. The premises of the rejection being manifestly in error, the rejection cannot stand. Thus, there is no proper basis of record for the §103(a) rejection of any of claims 9, 22, 40 or 59.

Seitz and Becher further lack any teaching that could have led one skilled in the art to selection of an auxiliary amine that increases the permeability of the shell as called for in claims 4, 5, 35 and 36. Yet Applicants' working examples, as illustrated in the drawings provide evidence of such effect.

#### **IV. Showing Under Rule 116; Request for Interview**

Applicants respectfully request entry of the instant Amendment D because the need for the amendment was not previously apparent, and the Office action of January 6, 2011 both withdraws the §112, written description rejection and raises new issues relating to enablement and obviousness.

Applicants further respectfully submit that the continuing rejections are based on misapprehensions which might be cleared up in an interview; and that an interview would in any case be of value to clarify and potentially narrow the issues for appeal.

Thus, Applicants' undersigned attorney respectfully requests that an interview be granted before the current deadline for appeal.

**CONCLUSION**

In view of the foregoing, reconsideration and allowance of claims 1-5, 11, 12, 17-36, 40, 42, 43, 48-49 and 94-96 is respectfully solicited.

The Commissioner is hereby authorized to charge any fees that may be due in connection with this response, to Deposit Account No. 19-1345.

Respectfully submitted,

/John K. Roedel, Jr./

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